

## **SeaBASS: A Marine BioAcoustics Summer School**

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### **LONG-TERM GOALS**

The goal of the SeaBASS (Marine BioAcoustics Summer School) was to provide the opportunity for graduate students interested in pursuing careers in marine bioacoustics to develop a strong foundation of both marine animal biology and acoustics, foster technical communication across disciplines, and develop professional relationships within the field. This gave students an opportunity to learn from experts who discussed topics not often offered at universities due to the relatively small demand at any one institution.

### **OBJECTIVES**

1. To provide fundamental concepts of underwater sound and marine animal biology and behavior to graduate students interested in pursuing careers in marine animal bioacoustics.
2. To create an environment for the open exchange of ideas related to current hot topics and challenges facing the field of marine animal bioacoustics.

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3. To foster professional relationships between graduate students and experts in the field.

## **APPROACH**

SeaBASS was structured after the successful PASS (Physical Acoustics Summer Session) that has been offered in alternate years for over two decades. SeaBASS was designed to support 30 graduate students and 10 expert lecturers. A week long curriculum was created where invited lecturers within the field of marine animal bioacoustics (academic, private, and management) provided half day seminars that described fundamental aspects of underwater sound and marine animal behavior, summarized the present state of the field, identified current obstacles and challenges, and discussed important “hot topics” areas (Table 1). Each seminar included an introductory lecture followed by group discussions or group projects to gain a more in-depth understanding of the issues and technology. Structured social activities also allowed for students and presenters to interact informally to develop lasting professional mentorships for guiding the next generation of marine bioacoustics scientists.

SeaBASS was hosted by the Applied Research Laboratory at The Pennsylvania State University. The week long summer session took place June 20-25, 2010 at the Penn Stater Conference Center in State College, PA. Selection of student participants was through an open application process. The application process was online ([http://www.arl.psu.edu/edu\\_seabass.php](http://www.arl.psu.edu/edu_seabass.php)), and preference was given to US citizens.

ONR funds contributed support for Room and Board fees for all participants, conference facility fees, and fellowships to graduate student applicants based upon need and qualifications. Twenty fellowships were awarded to defray costs of graduate student travel. Invited lecturers provided their time at no cost. Additional sponsors of the SeaBASS program included the Applied Research Laboratory at Penn State, the National Oceanic and Atmospheric Administration (NOAA), and the Acoustical Society of America (ASA).

**Table 1. SeaBASS 2010 schedule, topics, and presenters.**

	<b>Sunday June 20</b>	<b>Monday June 21</b>	<b>Tuesday June 22</b>	<b>Wednesday June 23</b>	<b>Thursday June 24</b>	<b>Friday June 25</b>
<b>7:00-8:00</b>		Breakfast and Welcome by E. Liszka (ARL Director)	Breakfast	Breakfast	Breakfast	Breakfast
<b>8:00-12:00</b>		<b>J. Miller</b> <i>Introduction to Underwater Sound</i>	<b>S. Van Parijs</b> <i>Communication and Behavior</i>	<b>M. Hastings</b> <i>Hearing</i>	<b>D. Mann</b> <i>Fish Acoustics</i>	<b>D. Mellinger</b> <i>Signal Processing</i>
<b>12:00-13:00</b>		Lunch	Lunch	Lunch	Lunch	Lunch and closing remarks by R. Stern (Assistant ARL Director)
<b>13:00-17:00</b>	Registration opens at 16:00	<b>D. Bradley</b> <i>Sound Propagation</i>	<b>W. Au</b> <i>Echolocation</i>	<b>J. Miksis-Olds (For R. Gentry)</b> <i>Effects of noise</i>	<b>J. Warren</b> <i>Active Acoustics</i>	<b>M. Holt</b> <i>Masking</i>
<b>18:00-19:30</b>	Dinner	Dinner	Dinner	Dinner	Dinner	Closing Dinner
<b>19:30-22:00</b>	Participant Introduction and Social	Poster Session and Social	Spikes Baseball game	Informal Career Discussions	Evening in Downtown State College	

## **WORK COMPLETED**

SeaBASS took place at the Penn Stater Conference Center in State College, PA from 20-25 June, 2010. Thirty-three graduate student applicants were admitted to the program from 60 eligible applications. A total of 8 applications and 20 informal inquiries were declined because they did not meet the course application and eligibility requirements:

- GPA 3.0 or higher during previous 2 years of study
- Currently enrolled in a Graduate program
- Personal Statement required

Applications were received from graduate students in 14 countries, and course attendees were accepted from six different countries (USA & Puerto Rico, Brazil, Peru, United Kingdom, Ireland, and New Zealand). Advertising for SeaBASS was published in the July issue of Acoustics Today 2010. Information on SeaBASS was also been distributed on the MARMAM and ASA Bioacoustics listservs. Informational flyers were distributed at Acoustical Society of America meetings, Society of Marine Mammalogy biennial conference (Quebec, 2009), American Fisheries Society meeting, and other appropriate society meetings.

The SeaBASS curriculum included a general introduction to underwater sound, 8 specialized marine bioacoustics topics, and a “Hot Topics” session on the effects of sound on marine animals (Table 1). Invited speakers presented material in half day sessions that included a traditional lecture covering fundamental topic concepts and an interactive activity consisting of analysis software demonstration and problem solving, experimental design exercises, group discussion, and a calibration exercise. Monday evening each student was given the opportunity to present a poster on their graduate research topic, methods, progress, or challenges. This gave students an opportunity to receive project feedback from peers and presenters. An informal career discussion took place mid-week where each invited presenter summarized their education and career path. Presenters openly shared personal experiences on issues not publically discussed in the field including family/career sacrifices, teaching vs research vs management pros/cons, value of post-doctoral experience, etc. Following the career synopses, students selected topics for additional round table discussions which consisted of family/career balance, challenges in a teaching career, pursuing post-doctoral positions, and obtaining funding. Social activities provided the opportunity for informal interactions in the evening.

Abstract books were presented to each participant at registration and included course schedule, participant directory, lecture slides for select topics, group activity information, and suggested readings.

## **RESULTS**

Course notes, topic outlines, participant and presenter list, and suggested readings for background information are posted on the SeaBASS website at <http://www.arl.psu.edu/education.php>. During the closing session, students and presenters were given the opportunity to share their experiences and thoughts about the SeaBASS Program. The bulleted points below capture what students and presenters expressed as the highlights of the course:

- Ability to address thesis project goals and complete research.
- Meeting scientists in the field to get to know the people behind the science.
- Openness and caliber of the speakers, students, and participants in the course.
- Having the instructors there for the duration of the entire course, with enough time for discussion informally.
- Getting to know other students in the field.
- Chance to interact with people involved in both the policy and science side of the issues.
- Collegial attitude of course participants.
- The diversity of experience, research, and regional location of participants and international openness.
- Hearing about acoustic concepts from multiple perspectives.
- Fun.

SeaBASS participants were also given the opportunity to formally evaluate the course through anonymous evaluation forms. Thirty two evaluation forms were returned. Table 2 summarizes the overwhelming positive response.

***Table 2. Summary of evaluation form comments. Rating scale = 0-5, where 0 is poor and 5 is excellent.***

Area	Average ratings	Common comments
Application Process	4.4	Overall, an easy application process though some found the web boxes difficult to enter data into
Number of Participants	4.7	Most people felt that the meeting was the correct size, and several noted that it shouldn't be any bigger.
Length of meeting	4.5	
Length of sessions	4.2	
Topics covered	4.6	
Activities	4.2	
Meeting room	4.7	The round table arrangement made it easy for interaction, but sometimes challenging to look at slides during presentations.
Hotel Rooms	4.9	
Meals	4.8	Overall people liked the meals, the only complaints were that there was too much good food!
Break room	4.8	
Arrival/Departure	4.3	This was the area of largest complaint, that travel options in and out of State College were limited, making departure on Friday after the lectures difficult.

Additional evaluation form comments are summarized below:

**Positive comments:**

- Overall, the response from all participants, presenters and students alike, were positive. From the returned survey forms, 18 of the respondents listed meeting and developing relationships with other students and faculty in the field to be the most valuable aspect of the course. Ten additional respondents listed learning the fundamentals of acoustics to be most valuable.

**Suggestions for improvement:**

- Scheduling with the lectures ending at 5pm on Friday made it difficult for some people to get flights (10 respondents) home the same day. In future courses, we would like to extend the meeting so people can have hotel and meals covered so that they can leave either Friday evening or Saturday morning.
- Participants indicated that some of the sessions were too long, and that we might need more activities or changing rooms to break up the sessions or longer break periods between sessions (11 respondents).
- Several participants indicated that having handouts for all the lectures, as well as readings and software, available before the meeting would allow them to be better prepared to get more out of the course (9 respondents). Request to provide handouts for all of the presentations in the abstract book (7 respondents).

**Suggested additional topics:**

- Several students requested more hands on introductions to recording techniques and calibration, as well as a session looking at experimental design of acoustic studies.

**IMPACT/APPLICATIONS**

The SeaBASS program allowed for extended interaction and discussion by students with each other and with leaders in the field of marine bioacoustics to define current and future research priorities and directions in the field. Evidence of the connections and collaborations made during SeaBASS is demonstrated by two SeaBASS student initiated, online networks on Facebook (26 members) (<http://www.facebook.com/#!/group.php?gid=133952333289137&v=wall&ref=ts>) and LinkedIn (14 members) (<http://www.linkedin.com/groups?mostPopular=&gid=3186754>). Subscribers have been using the online resources to exchange research ideas, seek feedback, solicit Matlab help, exchange information on upcoming conferences, and explore research funding opportunities.

**TRANSITIONS**

SeaBASS provided training for graduate students in the growing field of marine animal bioacoustics. Expertise in this area will contribute to the Navy's need to understand how sound may potentially impact marine animals, how marine animals use sound, and how to effectively monitor for presence of marine animals.

**RELATED PROJECTS**

Not applicable at this time.